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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of

**AMENDMENT OF PART 15 REGARDING
NEW REQUIREMENTS AND
MEASUREMENT GUIDELINES FOR
ACCESS BROADBAND OVER POWER
LINE SYSTEMS**

ET Docket No. 04-37

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To: The Commission

**Federal Communications Commission
Office of Secretary**

**CONSOLIDATED REPLY TO OPPOSITIONS
TO PETITION FOR RECONSIDERATION**

ARRL, the National Association for Amateur Radio, also known as the American Radio Relay League, Incorporated (ARRL), by counsel and pursuant to Section 1.429(g) of the Commission's rules [47 C.F.R. § 1.429(g)], hereby respectfully submits its Reply to certain¹ of the Oppositions to ARRL's Petition for Reconsideration filed in this proceeding. Each of this group of Oppositions pertains to one single aspect of ARRL's Petition for Reconsideration of the Commission's *Report and Order*² in the captioned proceeding. The argument contained in each Opposition is similar. In reply to the argument of the Opponents, ARRL states as follows:

1. Each of the Opponents similarly argues that the Commission should neither reconsider nor modify the 40 dB per decade distance extrapolation factor in power measurements of BPL systems.³ Each alleges that neither Aeronautical Radio, Inc. nor ARRL has, in *their* respective

¹ This Reply addresses the consolidated Opposition filed by Ameren Energy Communications, Virginia Electric and Power Company, and Tucson Electric Power Company (AEC/VEPCO/TEPC); the Opposition of Homeplug Power Line Alliance (Homeplug); and the Opposition of Intellon Corporation (Intellon). The foregoing entities will be collectively identified herein as the "Opponents." ARRL will separately and contemporaneously submit replies to the oppositions filed by Current Technologies, LLC, United Power Line Council, and Ambient Corporation, which address different or additional arguments.

² Carrier Current Systems, including Broadband over Power Line Systems, *Report and Order*, ET Docket No. 04-37, 19 F.C.R. 21,265 ("Report and Order").

³ Section 15.31(f)(1) and (2). See the *Report and Order* at Paragraphs 89-94 and 109.

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Petitions for Reconsideration in this proceeding, justified any change in the measurement standard below 30 MHz. The *Report and Order*, at paragraph 109, admitted that the Commission had no data of its own to justify the application of a 40 dB per decade extrapolation factor below 30 MHz (but 20 dB/decade above 30 MHz) for BPL systems. The Commission stated that it would continue the use of that factor, but that if new information became available that alternative emission limit/distance standards or extrapolation factors would be more appropriate, it would revisit the issue. It should have visited the issue in the first place in the *Report and Order*.

2. Any unbiased analysis of the record in this proceeding reveals that there is no technical support for the use of a 40 dB distance per decade extrapolation factor for line emitters such as overhead power lines used for Access BPL. There is ample justification for the use of the 20 dB per decade extrapolation factor below, as well as above, 30 MHz. The Commission claimed that it intended to “proceed cautiously” in authorizing BPL systems.⁴ It conceded that Access BPL systems were distributive and not “typical unintentional radiators.”⁵ It nevertheless applied an inapplicable standard for signal decay which was developed for use with point source radiators; it refused to establish a fixed measurement distance for BPL radiated emissions; and it adopted an inapplicable, overly liberal measurement standard for spectrum-polluting BPL emissions. This was not a prudent or “cautious” action by the Commission. It applied the same presumption in this instance that it applied throughout this proceeding: that the interference victim bears the burden of justifying the need for interference protection criteria. The standard is precisely backward: the burden of justifying the 40 dB/decade standard should have been placed on the proponents of the unlicensed, spectrum polluting technology.

⁴ See, the *Report and Order* at Paragraph 33.

⁵ *Id.*, at paragraph 124.

3. ARRL has provided a number of analyses, none of which have been rebutted by BPL advocates, which show that line emitters *do not decay at a 40 dB per decade rate* between measurements made at approximately 10 meters distance from the line extrapolated to 30 meters distance.⁶ In addition to the technical showings on this subject filed in the record in this Proceeding *which the Commission never addressed substantively in the Report and Order*, ARRL in Exhibit E of its Petition for Reconsideration provided NEC-model analyses of the *very models that the FCC stated that it used to make its determination that the 40 dB/decade test procedure did not need to be changed.*⁷ These analyses showed that a number of different models of line emitters, fed differentially or longitudinally in the fashion most commonly used in BPL systems did not have a 40 dB/decade relationship between measurements made at 1-meter height along the line and the point of maximum emission at 30 meters distance.

4. Common sense would surely indicate that if a 20 dB/decade extrapolation is appropriate at 30.001 MHz, it would not somehow suddenly jump to 40 dB/decade at 29.999 MHz. The formula that ARRL suggested in its Petition for Reconsideration takes into account the fact that some increase in the extrapolation factor was indeed seen in its analyses at 3.5 MHz, so some adjustment for the factor versus frequency is appropriate. But the present, arbitrary factor of 40 dB/decade at any frequency is not supported by electromagnetics physics or any of the record in this proceeding. The Opponents generally state that they do not want to see the 40 dB per decade factor modified, but none of the Oppositions offer a technical justification

⁶ See, e.g., ARRL Comments filed in May, 2004, at Exhibits C and D; ARRL Reply Comments at Exhibit A, Page 8; Exhibit B, Section 6.

⁷ The allegation made by Intellon is that the ARRL (and ARINC) modeling does not include an "attempt" to validate the model against actual measurements to show the model is producing correct results. ARRL has attempted repeatedly to cause the Commission to investigate numerous interference complaints at BPL test sites during the course of this proceeding. Thus far, FCC has failed to address these interference complaints in the presence of ARRL staff or in the presence of complainants. Any unbiased investigation of BPL test sites would provide an opportunity to determine both the actual interference potential of BPL systems and the actual signal decay levels. However, as discussed herein, the inapplicability of the 40 dB per decade standard is rather obvious on its face.

that supports retaining it. Current Technologies, in its Opposition, states that it has made measurements that, it claims, justifies the 40 dB/decade extrapolation, but it has not provided any of those measurements in the record in this proceeding.

5. In its submissions in this proceeding, Ameren did offer a few vague statements (not formal measurement data taken and reported using any valid scientific method) that its measurements had shown that the field strength decayed at a 40 dB/decade rate. However, this could be true only for measurements made along the ground, which makes them inapplicable, especially with respect to Amateur Radio interference. The Commission has claimed that one of its goals in this proceeding was to protect licensed radio services. In the Amateur Service, however, antennas in the high frequency (HF) bands are almost always located at heights equal to or greater than the power lines. The use of 40 dB per decade extrapolation will not protect against interference with respect to Amateur Radio antennas.

6. NTIA and others have provided significant analyses that show that if a large number of BPL emitters are deployed, they will raise the ambient levels of man-made noise worldwide. These analyses all presume that the field strength from individual emitters is indeed 29.54 dBuV/m at 30 meters distance. The angles of maximum radiation that will be propagated from overhead BPL lines are all upward from the line, not downward toward the ground. The Commission relied on these analyses in the *Report and Order*. For them to have any merit at all, the test methods used must determine accurately the point of maximum emissions above the power lines.⁸ ARRL's analysis of the NTIA and Ameren models show that if a 40 dB/decade

⁸ As ARRL argued in Exhibit E of its Reconsideration Petition, it is critical that the actual emissions at 30 meters from BPL-carrying power lines not exceed 30 uV/m. All of the NTIA Phase II conclusions were based on the premise that the field strength at 30 meters distant from the radiator is actually at 30 uV/m. So was the NTIA premise that 20 dB of attenuation in the 13 BPL restricted bands is sufficient to generally protect government operation. If 40 dB/decade is used to extrapolate measurements made as described in the FCC BPL test procedures, the field strength at 30 meters distance will exceed 30 uV/m. This would have the effect of invalidating all of the assumptions on which the skywave and interference analyses done by NTIA were based.

extrapolation is used, the test will not accurately reflect the actual maximum emissions from these systems.

7. Contrary to the insistence of some of the petitioners, overhead power lines are not point source radiators. The Commission's test data obtained in Briarcliff Manor, NY at the BPL test site and released *after* the *Report and Order* best represents this.⁹ See Exhibit B, page 7, Figures 4-6 of ARRL's Petition for Reconsideration. Although some increase in RF emissions is seen at the injection points in some cases, the emissions remain strong along the lines for considerable distances. The Commission correctly concluded in the *Report and Order* that power lines are not point sources.¹⁰ A 20 dB per decade extrapolation must be used for line emitters, which includes overhead lines used for access BPL.

8. Homeplug and Intellon argue that ARRL has not provided any "new evidence" with respect to the inapplicability of the 40 dB per decade factor. This is not accurate. ARRL provided a valid and conclusive evaluation of the NTIA and Ameren models that the Commission claimed it used in the *Report and Order*, which shows conclusively that 40 dB per decade from measurements made at ground level do not equate to actual field strengths at 30 meters distance. See, Exhibit E to ARRL's Reconsideration Petition. Not one comment addressed to that Exhibit appears in any of the Opponents' unsupported claims. ARRL's conclusions with respect to the NTIA and Ameren data were as follows:

- A 40-dB/decade extrapolation underestimates the maximum field strength at 30 meters by as much as 11.5 dB. Although some near-field effects can be seen at lower frequencies, applying a 40-dB/decade extrapolation results in a significant error. The original statements made in the NTIA Phase I report and the engineering conclusions

⁹ See, the FCC Field Studies placed in the record in this proceeding after the release of the *Report and Order*, pursuant to ARRL's Freedom of Information Act request.

¹⁰ At paragraph 98 of the *Report and Order*, the Commission cited NTIA's conclusion that, in most cases, peak field strength levels are not centered on the BPL device, and that multiple segments of the power lines and impedance discontinuities are the most significant BPL signal radiating elements.

drawn by ARRL were correct: a 20- dB/decade distance extrapolation should be applied to measurements made closer than 30 meters distance.

- These data also show that, from the information provided by ARRL, NTIA, Ameren and others, an extrapolation for height for frequencies below 30 MHz should be applied. These data generally support the ARRL and Ameren position that 3.5 dB should be added to H field values measured at 1 meter in height.
- The data also show that it would be reasonable to apply a slightly greater than 20- dB/decade factor at lower frequencies.

Homeplug further claims at page 5 of its filing that ARRL's models use low voltage power lines that are "extremely long compared to the relatively short lines found in most typical neighborhoods." Homeplug should have read ARRL's Petition for Reconsideration more carefully. ARRL models did not represent low-voltage lines. They represented medium-voltage lines. Due to its fundamentally erroneous assumption, the remainder of Homeplug's remarks with respect to ARRL's analysis of NTIA models is irrelevant.

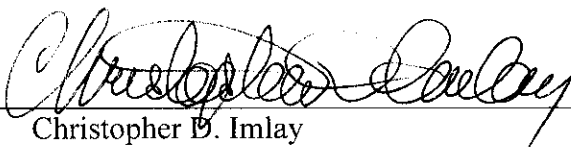
9. The Opponents claim that ARINC's engineering study concerning distance extrapolation for in-building BPL systems, low-voltage wiring, or underground systems, is inaccurate. ARRL has not analyzed the emissions from underground transformers or building wiring, so it has not taken any position with respect to the appropriate distance extrapolation factor to be used for these types of emitters. ARRL will, however, be making additional measurements of BPL test facilities and any deployments that might be made in the future, and it will provide the Commission with additional data on this subject in the near future. The inapplicability of the 40 dB per decade extrapolation factor with respect to BPL emissions from overhead medium-voltage lines below 30 MHz is beyond reasonable dispute, and the Commission should change the standard in Section 15.31(f)(1) and (2) now, before more harmful interference is caused to Amateur Service stations.

Therefore, for all of the above reasons, ARRL, the National Association for Amateur Radio, again requests that the Commission reconsider, rescind and re-study in further proceedings the rules governing Access Broadband Over Power Line systems in accordance with ARRL's Petition for Reconsideration, and in this case specifically the Section 15.31(f)(1) and (2) rules regarding the distance extrapolation of field strength of BPL signals on overhead power lines.

Respectfully submitted,

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April 1, 2005

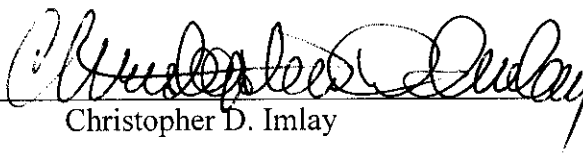
CERTIFICATE OF SERVICE

I, Christopher D. Imlay, do hereby certify that I caused to be mailed, via first class U.S. Mail, postage prepaid, a copy of the foregoing **CONSOLIDATED REPLY TO OPPOSITIONS TO PETITIONS FOR RECONSIDERATION**, to the following, this 1st day of April, 2005.

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